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RESULTS OF 1990 VEGETATION AND TORTOISE SURVEYS
OF THE GOLD BUTTE PERMANENT STUDY PLOT, NEVADA

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ABSTRACT

The 1990 spring survey of the Gold Butte permanent study plot was conducted by three to four people over 22 days between May 9 and May 30, 1990. Thirty-two individual tortoises were located, of which 21 had been previously marked in 1986. Overall male to female sex ratio was 0.61:1.00, but varied considerably with size classes. Tortoises marked in 1986 that were recaptured in 1990 had increased little in size. Sixty-two tortoise carcasses were found on the plot, seven of which were of tortoises marked in 1986.

INTRODUCTION

This report presents results of the 1990 tortoise survey of the Gold Butte permanent study plot located in southeast Nevada approximately 30 miles south of Mesquite. A previous survey was conducted on this plot in 1986. The 1990 survey was run in accordance with specifications listed in the Request for Proposals (RFP), which have been standardized for BLM plots. Field work included tortoise surveys during which the entire plot was covered four times, twice during each survey period. A vegetation plot was established and measurements were taken of perennial and annual plants. Copies of all field notes and photographs have been submitted separately.

DESCRIPTION OF THE STUDY PLOT

The Gold Butte Study Plot is located on a mostly gently sloping bajada with sandy soil. The eastern part of the study area is flatter, has fewer washes, and generally supports more open vegetation than the west. Vegetation on the plot is remarkably homogeneous for such a large area and consists of Mohave Desertscrub dominated by creosotebush and white bursage throughout. Canopy species of secondary abundance include joshua tree, Mohave yucca, and ratany. Common cacti present on the site include silver cholla, barrel cactus, beavertail cactus, and buckhorn cholla. Scattered catclaw acacias occur in larger washes, but are rare on uplands. A list of all perennial plant species observed on the plot is provided in Table 1.

Though the Gold Butte Plot is covered by a fairly homogeneous plant community, variations in the amount of cover and species abundances occur within the plot. Yuccas are generally more numerous and creosotebush and white bursage are fewer in the northwest corner of the plot. The size and density of creosotebush generally increase toward the southeast and yuccas decrease. Plant cover and species composition vary with local changes in topography as well.

A 2 x 100 m vegetation plot was established on the plot as prescribed in the RFP protocols. The plot was located along the north-south midline of the plot approximately 600 feet south of the north edge of the plot (stake NE3NW2). The origin of the transect is located at the north end and is marked with a five-foot wooden stake marked with red flagging tape, and a four-foot rebar stake. The south end of the plot is marked with a four-foot rebar stake and one-foot rebar stakes mark the outer edge of the plot at the origin, the half-way point (50 m), and the end. The one-foot stake at the end of the plot is offset only one meter from the west side because the two-meter point is in the middle of a white bursage.

Perennial and annual vegetation were measured on the plot according to protocols specified in the RFP. Results are presented in Tables 2 and 3. Though these results



provide a fairly reasonable representation of the character of the study plot, they do not provide an adequate sample to describe the variation in dominance and amount of vegetation present on the plot. For example, the relative volume of joshua trees, which was 38.7 percent of the total plot volume, was severely over-represented. The high volume was provided by only three large plants, and the species is actually quite uncommon in the area of the transect. Moving the plot a short distance in any direction would provide radically different values. To obtain an accurate representation of the vegetation, many more samples, located in various parts of the study plot, would be necessary. A single plot of only 200 square meters is too small to represent the vegetation of an area of approximately 256 hectares, no matter how homogeneous the vegetation appears to be. This small sample size also severely limits the ability to detect any changes in vegetation occurring on the plot through time. A local die-off of a few plants or one lush patch of annuals could easily give the false impression of a significant plot-wide vegetation change.

Few annual plants were found on plots and values for all parameters were quite low. This was partly because annuals were actually quite sparse, but also because of the relative lateness of the season when plots were measured. Most annuals were already dry and many were represented only by dried remnants.

MATERIALS AND METHODS

Survey of the Gold Butte Permanent Desert Tortoise Study Plot (PSP) located in T18S, R71E, Section 9, Clark County, Nevada, began on May 7 1990. Two days were spent marking the perimeter of the study plot and dividing it into 1/16 square mile grids. The grids were numbered 1 through 16, and each grid was divided into 1/4 sections. These sections were labeled NW, NE, SW, or SE depending on their location (see Figure 1). Grid stakes remaining from a previous survey were used as much as possible. Because corners of the plot were identified incorrectly by BLM personnel, the plot boundaries established in 1990 did not appear to mark a square mile, and it appeared that stakes from the previous survey were not always placed in straight lines. Despite these problems, deviations from a perfect square mile divided into equal sized subplots appeared to be minor.

Tortoise surveys were begun on May 9, 1990. Three people surveyed 0.20 square mile per day for 10 days to complete one full survey (with the plot covered twice). Transect lines were approximately 20 yards apart. Each person normally walked six one-mile transects per day for a total of 18 transects for an area of approximately 128 acres (0.20 mile x 1 mile). The study plot was covered twice during each survey period -- once from north to south and once east to west. The study plot was completely surveyed two times and a total of sixty person days were spent during the search effort.

Weather conditions during surveys were generally good. Temperatures were typical for spring, but there was no rainfall and no sign of recent rainfall. Daily weather conditions and temperatures were recorded in the field notes.

The location of each tortoise encountered was plotted on a grid sheet and noted in the field notes. As required by the Bureau of Land Management (BLM), each person handling a tortoise wore disposable rubber gloves. Tortoises were carefully examined. Any anomalies, ticks, predator marks, previous notches or fungi were noted on the data sheets and described in the field notes. Tortoises were examined for symptoms of Upper Respiratory Disease Syndrome (URDS). Results of these examinations can be found



on the Health Profile Form filled out for every tortoise. Measurements were taken from 8 places: maximum carapace length (mcl), the post at the third marginal (m3), the middle of the fourth marginal (m4), the seam between marginals 7 and 8 (m7-8), the greatest width (grtw), height at the center (ht), distances between plastron notches (pin) and plastron tips (pit). Tortoises were also weighed. All measurements were recorded on a data sheet with date, location, time of day, sex, and tortoise number. A tortoise marked from a previous survey was retouched, and its number epoxied onto its shell on the right costal scute. Original captures were notched and numbered in the same manner beginning with #113. Numbers corresponding to marginals on the bridge were avoided in order to prevent unnecessary stress. Before being released, photographs of the tortoises' carapace, plastron, and left costal scute were taken. All equipment was sterilized with alcohol after contact with a tortoise to prevent the spread of URDS.

Carcasses of tortoises were collected and labeled with a letter. The location of each carcass was recorded on a grid sheet, as well as the field notes. All carcasses were photographed in situ. A shell data card was completed for all carcasses. Any piece of a tortoise carcass was collected and considered one carcass.

RESULTS AND DISCUSSION

Thirty-two individual tortoises were encountered during the 60 day spring survey. Twenty-one of the 32 tortoises encountered had been captured and marked in 1986. Eight tortoises were recaptured once and one tortoise was recaptured twice for a total of 41 encounters. Of the 21 tortoises encountered during the first survey period (May 8-18), one was a recapture, 10 had been marked in 1986, and ten were unmarked. Of the 20 tortoises encountered in the second survey period (May 19-27), 8 were recaptures (4 of tortoises marked in 1986, 4 of tortoises marked in 1990), 11 had been marked in 1986 but were not observed during the first survey, and one was unmarked. One of the 8 recaptures was a repeat and one was of a tortoise marked during the second survey period. Thus, only 6 of the 18 individual tortoises encountered during the second survey period had been encountered during the first survey. Such a low percentage of "recaptures" does not allow a very robust estimate of total population size. Using the simple Lincoln Index to estimate total number of tortoises on the study plot yields an estimate of 60 individuals. Using the Bailey method results in an estimate of 54 individuals. Locations of all tortoises encountered are shown in Figure 2.

Only one of the 32 tortoises encountered, a female with an MCL of 207 mm (No. 32), showed possible signs of URDS, which was apparently labored breathing with a slight wheezing. Two tortoises, a male with an MCL of 280 mm (No. 121) and a male with an MCL of 241 mm (No. 46), had limited areas with fungal growths on their front legs.

The overall male to female sex ratio of adult and subadult tortoises found on the plot was 0.61:1.00 (11 males, 18 females; Table 4). Sex ratios of adult tortoises of various size classes differed considerably; the ratio of males to females for tortoises over 240 mm MCL ($n = 11$) was 2.67:1.00, while the ratio for tortoises between 207 and 240 mm was 0.14:1.00. The population consisted of 11 adult-2, 16 adult-1, 2 subadult, and 3 immature-2 tortoises (Table 5).

Growth changes for tortoises first measured in 1986 and recaptured in 1990 ranged from -10 mm to 48 mm over the four year period (Table 6). Significant growth occurred only for the two smallest tortoises, whose MCL increased approximately 12 and 23 %, respectively. Larger tortoises showed very little growth. The greatest increase in MCL



during the four year period was only 5 mm (percent increases of less than 2.3 % for all three tortoises), and only 4 of 19 larger tortoises averaged more than a 1 mm yearly average increase in MCL.

A list of the dates of all tortoise captures and recaptures on the Gold Butte study plot in 1990 is presented in Table 7.

No tortoises were observed feeding during the study, but ten of the tortoises captured had food stains around their mouths. Eight had green stains, probably from vegetative materials, one had reddish stains, probably from cactus fruit, and one had both green and red stains.

A total of sixty-two carcasses were collected. Seven of these were carcasses of tortoises that had been previously marked in 1986 by Russell Duncan. The tortoise numbers of the seven carcasses were: 35, 54, 59, 65, 81, 88, and one undeterminable. Locations of carcasses are shown in Figure 3.

Significantly fewer (32) tortoises were found on the Gold Butte Plot in 1990 than in 1986 (89). The high number of carcasses, including those of seven which had been marked in 1986, suggests a significant mortality in the four years but estimates of mortality rates cannot be made with the limited data available. Proximate and ultimate causes of mortality can rarely be determined from field examination of tortoise carcasses. The absence of juvenile tortoises or carcasses suggests that reproduction in recent years has been low.



Table 1. List of perennial plants observed on the study plot. Species marked with an asterisk were confined primarily to washes.

Creosotebush	<i>Larrea tridentata</i>
White Bursage	<i>Ambrosia dumosa</i>
Joshua Tree	<i>Yucca brevifolia</i>
Mohave Yucca	<i>Yucca schidigera</i>
Ratany	<i>Krameria grayi</i>
Silver Cholla	<i>Opuntia echinocarpa</i>
Teddy Bear Cholla	<i>Opuntia bigelovii</i>
Buckhorn Cholla	<i>Opuntia acanthocarpa</i>
Beavertail Cactus	<i>Opuntia basilaris</i>
Barrel Cactus	<i>Ferocactus acanthodes</i>
Pineapple Cactus	<i>Neolloydia (= Echinomastus) johnsonii</i>
Hedgehog Cactus	<i>Echinocereus engelmannii</i>
Desert Trumpet	<i>Eriogonum inflatum</i>
Turpentine Broom	<i>Thamnosma montana</i>
Nevada Ephedra	<i>Ephedra nevadensis</i>
Wolfberry	<i>Lycium pallidum</i>
Globemallow	<i>Sphaeralcea ambigua</i>
Paper-Bag Bush	<i>Salazaria mexicana*</i>
Indigo Bush	<i>Dalea amoena*</i>
Catclaw Acacia	<i>Acacia greggii*</i>
Burro Brush	<i>Hymenoclea salsola*</i>
Wooly Bur Sage	<i>Ambrosia eriocentra*</i>
Desert Buckwheat	<i>Eriogonum fasciculatum*</i>

Table 2. Perennial plant information. All relative values are percentages.

Species	Density (/ha)	Rel. Dens.	Volume (cm ³ /ha)	Rel. Vol.	Frequency	Rel. Freq.
<i>Larrea tridentata</i>	1350	27.8	854,221,900	52.4	28	25.9
<i>Ambrosia dumosa</i>	3000	61.9	102,944,000	6.3	64	59.3
<i>Yucca brevifolia</i>	150	3.1	630,389,450	38.7	4	3.7
<i>Krameria grayi</i>	200	4.1	19,393,200	1.2	6	5.6
<i>Opuntia echinocarpa</i>	50	1.0	22,996,450	1.4	2	1.9
<i>Opuntia bigelovii</i>	50	1.0	1,022,600	0.1	2	1.9
<i>Eriogonum inflatum</i>	50	1.0	450	T*	2	1.9

* < 0.1%



Table 3. Annual plant information. All relative values are percentages.

Species	Cover (cm ² /m ²)	Rel. Cover	Bio- mass	Rel. Biom.	Freq.	Rel. Freq.	Non-grass Density	Rel. Dens.
<i>Astragalus</i>								
<i>nuttallianus</i>	2.8	14.3	.06	7.4	20	15.2	7.6	31.1
<i>Plantago insularis</i>	2.8	14.3	.04	5.7	28	21.2	3.6	14.8
<i>Bromus rubens</i>	5.6	28.6	.19	24.1	32	24.2	---	---
<i>Chorizanthe rigida</i>	1.6	8.2	.19	24.9	8	6.1	2.4	9.8
<i>Erodium cicutarium</i>	4.4	22.4	.27	34.5	20	15.2	8.0	32.8
<i>Chaenactis fremontii</i>	0.8	4.1	.01	0.7	8	6.1	0.8	3.3
<i>Eucrypta micrantha</i>	0.4	2.0	T	0.3	4	3.0	0.4	1.6
<i>Eriophyllum lanosum</i>	0.4	2.0	T	0.6	4	3.0	0.8	3.3
<i>Phacelia [affinis]</i>	0.4	2.0	.01	1.0	4	3.0	0.4	1.6
Unknown	0.4	2.0	.01	0.8	4	3.0	0.4	1.6

Table 4. Sex ratios of adult, subadult, and all tortoises found on the Gold Butte study plot, 1990. M = Male, F = Female.

Age Class	Size (mm)	No.	No. M	Percent M	No. F	Percent F	Sex Ratios
Adult-2	>240	11	8	72.7	3	27.3	2.67
Adult-1	207-240	16	2	12.5	14	87.5	0.14
Subadult	180-207	2	1	50.0	1	50.0	1.00
Total		29	11	37.9	18	62.1	0.61



Table 5. Distribution of desert tortoises among seven age/size classes on the Gold Butte study plot, 1990.

Age Class	Size (mm)	No.	Percent
Adult-2	>240	11	34.4
Adult-1	208-239	16	50.0
Subadult	180-207	2	06.3
Immature-2	140-179	3	09.4
Immature-1	100-139	0	00.0
Juvenile-2	60-99	0	00.0
Juvenile-1	<60	0	00.0
Total		32	100.1

Table 6. Analysis of growth of desert tortoises recaptured which were marked in previous years on the Gold Butte study plot.

Tortoise No.	Sex	Recapture Date	Original Mark Date	No. Years	1990 MCL	1986 MCL	Diff.	Mean Annual Growth
13	F	5/25/90	4/17/86	4	240 - 235	5	1.25	
14	F	5/26/90	5/07/86	4	231 - 229	2	0.50	
21	M	5/19/90	4/18/86	4	259 - 257	2	0.50	
32	F	5/20/90	4/24/86	4	207 - 159	48	12.00	
46	M	5/21/90	5/08/86	4	241 - 241	0	0.00	
51	F	5/10/90	5/09/86	4	225 - 229	-4	- 1.00	
52	M	5/15/90	5/09/86	4	264 - 261	3	0.75	
57	F	5/19/90	5/10/86	4	260 - 256	4	1.00	
58	F	5/15/90	5/10/86	4	239 - 236	3	0.75	
61	F	5/23/90	5/09/86	4	225 - 235	-10	- 2.50	
73	M	5/14/90	5/15/86	4	272 - 274	-2	- 0.50	
75	M?	5/20/90	5/17/86	4	173 - 155	18	4.50	
76	F	5/18/90	5/16/86	4	212 - 213	-1	- 0.25	
79	M	5/08/90	5/18/86	4	287 - 282	5	1.25	
84	F	5/11/90	5/17/86	4	227 - 226	1	0.25	
86	F	5/14/90	5/18/86	4	233 - 229	4	1.00	
89	F	5/21/90	6/03/86	4	246 - 245	1	0.25	
91	F	5/20/90	6/02/86	4	225 - 220	5	1.25	
93	F	5/17/90	6/03/86	4	215 - 217	-2	- 0.50	
95	M	5/09/90	5/19/86	4	275 - 278	-3	- 0.75	
96	F	5/26/90	5/20/86	4	231 - 232	-1	0.25	

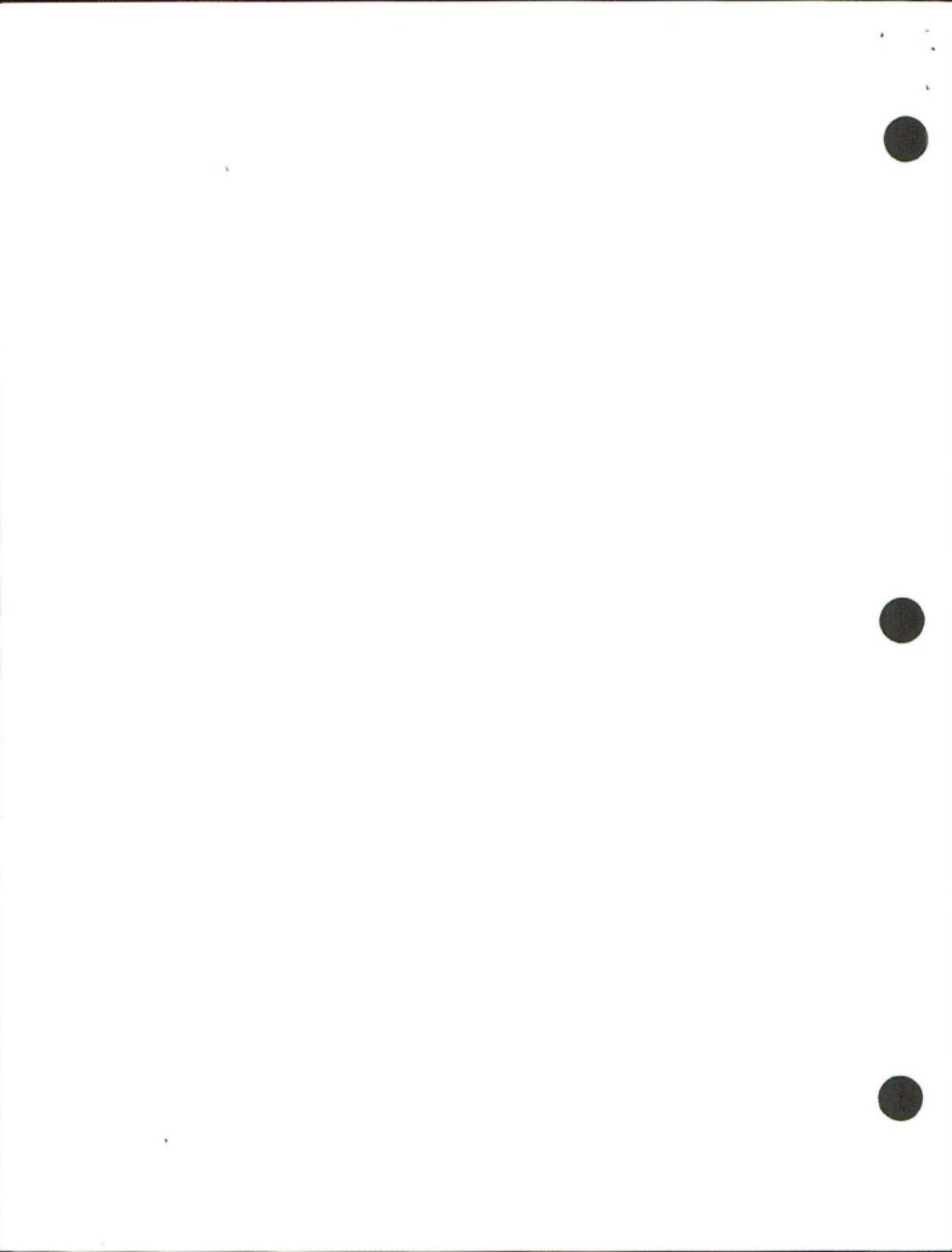


Table 7. List of captured desert tortoises (identification numbers) during survey of the Gold Butte study plot: tortoises > 140 mm carapace length.

Date	First Captures Any Year ¹	First Captures This Date ²	Recaptures This Date ³
5/08/90		79	
5/09/90	113, 118	113, 118, 95	
5/10/90	119, 120	119, 120, 51	
5/11/90	122, 121	122, 121, 84	
5/12/90	123	123	
5/14/90	128	128, 73, 86	
5/15/90		58, 52	118
5/16/90	129, 130	129, 130	
5/17/90		93	
5/18/90		76	
5/19/90		21, 57	130
5/20/90		32, 75, 91	128
5/21/90		46, 89	
5/22/90			58, 21*
5/23/90		61	
5/24/90			84
5/25/90		13	123
5/26/90	131	131, 14, 96	58
5/27/90			119

¹ Interpreted to mean tortoises captured for first time on plot in any survey; that is a tortoise not previously marked in 1986 or 1990.

² Interpreted to mean tortoises marked in 1986 or unmarked captured for the first time in 1990.

³ Interpreted to mean tortoises marked in 1986 or 1990 captured for the second time in 1990.

* Off plot.



NW 4	NE 4	NW 3 75 120 126	NE 3	NW 2	NE 2	NW 1	SE 1
73		3		128	2		1
4	(119)						
21							
② SW 4	137 91	SW 3	SE 3	SW 2	SE 2	SW 1	SE 1 NE 8
NW 5	NE 5 119	NW 6 50	NE 6	NW 7	NE 7	NW 8	
52		6		7		8	
118	5				58		
139	(130)	95	SE 6 129	SW 7	SE 7 96	SW 8	SE 8 619
SW 5	SE 5 NE 12	SW 6 NW 11	NE 11	NW 10	NE 10	NW 9	
NW 12							
12		11		13	10		9
					46		
SW 12	SE 12 NE 13	SW 11 NW 19	SE 11 122	SW 10 99 93	SE 10 123	SW 9 NE 15 NW 16	SE 9 NE 15
NW 13							
13		14			15		16
13		(94)	84	SE 14 SW 15	123 J6.5	SW 16	SE 16
SW 13	SE 13 SW 14						

Figure 1. Locations of live desert tortoises found during the 1990 survey of the Gold Butte Study plot. Tortoise number 57 was found off the plot and is not shown.



NW4 PP	NE4	NW3	NE3	NE 2 OO	NE2	NW1	NE1
(A) 4 HH	JJ	3		W W	PP		
SW4 NW5 N ³	SE4 NES	SW3 NWb J	SE3 NE6	SW2 NW7 M	SE2 N ⁶ O	SW1 NW8 R R	SE1 NE8
5 EE	E	6 MM			7		8 CCC
SW5 NW12 EE	SE5 NW12 DD	SW6 NW11 L	SE6 NE11	SW7 NW10	SE7 NE20	SW8 NW9 BBB	SE8 NE9
12 AA YY EE	(H)	11 Z		NN ZZ	10 XX		9
SW12 NW13 EE	SE12 NE13	SKK11 NW19 L	SE11 NE14	SW10 NW15 WW	SE10 NE15	SW9 NW16 BB	SE9 NE16
13 UU YY GG	14 G JJ SE13		15 SE14	16 SW15 BB	SE15 SW16		SE16

Figure 2. Location of tortoise carcasses found on the Gold butte study plot in 1990. Six additional carcasses (AA,GG,SS,TT,GGG,HHH) were found off the plot.

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